## WHAT IS CLAIMED IS:

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1. A compound of the following formula:

2 3 4 wherein F is a fullerene core; 5 E is  $Y_1, Y_2$ -amino,  $Y_2$ -amino,  $(Y_1, Y_2$ -alkyl)-amino,  $Y_1, Y_2$ -ethylenediamino, 6 (dihydroxymethyl)alkylamino,  $(X_1, X_3$ -aryl)amino,  $X_1, X_3$ -aryloxy,  $Y_2$ -alkoxy,  $Y_1, Y_2$ -alkoxy, 7 (Y<sub>1</sub>,Y<sub>2</sub>-amino)alkoxy, (Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>-aryl)oxy, (dihydroxyalkyl)-aryloxy, (Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>-alkyl)amino, 8  $(Y_1, Y_2, Y_3$ -aryl)amino, dihydroxyalkylamino,  $Y_1, Y_2, Y_3$ -alkoxy, (trihydroxyalkyl)alkoxy, 9 (trihydroxyalkyl)alkylamino, (dicarboxyalkyl)amino,  $(Y_1, Y_2, Y_3-alkyl)$ thio,  $(X_1, X_3-alkyl)$ 10 aryl)thio, (Y<sub>1</sub>, Y<sub>2</sub>-alkyl)thio, (dihydroxyalkyl)thio, Y<sub>1</sub>, Y<sub>2</sub>-dioxoalkyl, tri-(Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub>-11 methylaminocarboxyethyl)methylamino, ((glycosidyl)oxoheteroaryl)amino, 12 ((glycosidyl)oxoaryl)amino, (X<sub>1</sub>,X<sub>2</sub>,X<sub>3</sub>-heteroaryl)amino, (X<sub>1</sub>-diarylketone)amino, (T,X<sub>1</sub>-13 oxoaryl)amino, (T,X<sub>1</sub>-dioxoaryl)amino, (Y<sub>1</sub>-alkyl,Y<sub>2</sub>-alkyldioxoheteroaryl)amino, (Y<sub>1</sub>-14 alkyl, Y<sub>2</sub>-alkyldioxoaryl)amino, (di(Y<sub>1</sub>, Y<sub>2</sub>-methyl)dioxoheteroaryl)amino, (di(Y<sub>1</sub>, Y<sub>2</sub>-15 methyl)dioxoaryl)amino, ((glycosidyl)heteroaryl)amino, ((glycosidyl)aryl)amino, 16 ((carboxylacetylalkyl)oxo-heteroaryl)amino, ((carboxylacetylalkyl)oxoaryl)amino, 17 ((isopropylaminohydroxy-alkoxy)aryl)amino,  $(X_1, X_2, X_3$ -alkylaryl)amino,  $(X_1, X_2, X_3$ -18 heteroaryl)oxy, (isopropylaminohydroxyalkyl)aryloxy, (X<sub>1</sub>,X<sub>2</sub>,X<sub>3</sub>-oxoheteroaryl)oxy, 19  $(X_1, X_2, X_3$ -oxoaryl)oxy,  $(X_1, Y_1$ -oxoheteroaryl)oxy,  $(X_1$ -diarylketone)oxy,  $(T, X_1$ -oxoaryl)oxy, 20  $(X_1, X_2$ -dioxoaryl)oxy,  $(Y_1, Y_2, di$ -aminodihydroxy)alkyl,  $(X_1, X_2$ -heteroaryl)thio, 21 ((tricarboxylalkyl)ethylene-diamino)alkoxy,  $(X_1, X_2$ -oxoaryl)thio,  $(X_1, X_2$ -dioxoaryl)thio, 22 (glycosidylheteroaryl)thio, (glycosidylaryl)thio, Y<sub>1</sub>-alkyl(thiocarbonyl)thio, Y<sub>1</sub>,Y<sub>2</sub>,-23

alkyl(thiocarbonyl)thio, Y1,Y2,Y3-alkyl(thiocarbonyl)thio, (Y1,Y2-aminothiocarbonyl)thio,

(pyranosyl)thio, cysteinyl, tyrosinyl, (phenylalainyl)amino, (dicarboxyalkyl)thio,

 $(aminoaryl)_{1-100}$ amino,  $(pyranosyl)_{1-100}$ amino,  $(Y_1-aminoaryl)_{1-100}$ amino,

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(amino(sulfoaryl))1100amino, peptidyl, thymidinyl, uridinyl, guanosinyl, adenosinyl,
27
                                            cholesteryl, or biotinylalkoxy; each T, independently, being halo;
28
                                                                                        each of X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub>, X<sub>4</sub>, and X<sub>5</sub>, independently, is -Y<sub>2</sub>, -O-Y<sub>2</sub>, -S-Y<sub>2</sub>, -NH-Y<sub>2</sub>, -CO-O-
29
                                            Y_2, -O-CO-Y_2, -CO-NH-Y_2, -CO-NY<sub>1</sub>Y_2, -NH-CO-Y_2, -SO<sub>2</sub>-Y<sub>2</sub>, -SO<sub>2</sub>-O-Y_2, -CHY<sub>1</sub>Y_2, or
30
                                            -NY_1Y_2;
31
                                                                                         each of Y<sub>1</sub>, Y<sub>2</sub>, and Y<sub>3</sub>, independently or taken together, is -B-Z or -Z; in which each
32
                                            B, independently, is -R^a-O-[Si(CH<sub>3</sub>)<sub>2</sub>-O-]<sub>1-100</sub>, C<sub>1-2000</sub> alkyl, C<sub>6-40</sub> aryl, C<sub>7-2000</sub> alkylaryl, C<sub>7-2000</sub>
 33
                                             _{2000} arylalkyl, (C_{1-30} alkyl ether)_{1-100}, (C_{6-40} aryl ether)_{1-100}, (C_{7-2000} alkylaryl ether)_{1-100}, (C_{7-2000} alkylaryl ether)_{1-100}, (C_{7-2000}
 34
                                              _{2000} arylalkyl ether)_{1-100}, (C_{1-30} alkyl thioether)_{1-100}, (C_{6-40} aryl thioether)_{1-100}, (C_{7-2000} alkylaryl
 35
                                              thioether)<sub>1-100</sub>, (C_{7-2000} \text{ arylalkyl thioether})_{1-100}, (C_{2-50} \text{ alkyl ester})_{1-100}, (C_{7-2000} \text{ aryl ester})_{1-100},
 36
                                              (C_{8-2000} \text{ alkylaryl ester})_{1-100}, (C_{8-2000} \text{ arylalkyl ester})_{1-100}, -R^a-CO-O-(C_{1-30} \text{ alkyl ether})_{1-100}, -R^a-CO-O-(C_{1-30} \text{ alkyl
 37
                                              R^a\text{-CO-O-}(C_{6\text{--}40} \text{ aryl ether})_{1\text{--}100}, -R^a\text{-CO-O-}(C_{7\text{--}2000} \text{ alkylaryl ether})_{1\text{--}100}, -R^a\text{-CO-O-}(C_{7\text{--}2000} \text{ alkylaryl ether})_{1\text{--}100}, -R^a\text{-CO-O-}(C_{7\text{--}2000} \text{ alkylaryl ether})_{1\text{--}100}, -R^a\text{-CO-O-}(C_{7\text{--}2000} \text{ alkylaryl ether})_{1\text{--}100}, -R^a\text{--CO-O-}(C_{7\text{--}2000} \text{ alkylaryl ether})_{1\text{--}100}, -R^a\text{--C
  38
                                               arylalkyl\ ether)_{1\text{-}100}, (C_{4\text{-}50}\ alkyl\ urethane)_{1\text{-}100}, (C_{14\text{-}60}\ aryl\ urethane)_{1\text{-}100}, (C_{10\text{-}2000}\ alkylaryl\ 
   39
                                               ure than e)_{1-100}, (C_{10-2000} \ arylalkyl \ ure than e)_{1-100}, (C_{5-50} \ alkyl \ ure a)_{1-100}, (C_{14-60} \ aryl \ ure a)_{1-100},
   40
                                                (C_{10\text{-}2000} \text{ alkylaryl urea})_{1\text{-}100}, (C_{10\text{-}2000} \text{ arylalkyl urea})_{1\text{-}100}, (C_{2\text{-}50} \text{ alkyl amide})_{1\text{-}100}, (C_{7\text{-}60} \text{ arylalkyl urea})_{1\text{-}100}, (C_{2\text{-}50} \text{ alkyl amide})_{1\text{-}100}, (C_{7\text{-}60} \text{ arylalkyl urea})_{1\text{-}100}, (C_{7\text{-}60} \text{ ary
    41
                                                 amide)_{1-100}, (C_{8-2000} alkylaryl amide)_{1-100}, (C_{8-2000} arylalkyl amide)_{1-100}, (C_{3-30} alkylaryl amide)_{1-100}
    42
                                                 anhydride)_{1-100}, (C_{8-50} aryl anhydride)_{1-100}, (C_{9-2000} alkylaryl anhydride)_{1-100}, (C_{9-2000} arylalkyl
    43
                                                 anhydride)_{1-100}, (C_{2-30} \text{ alkyl carbonate})_{1-100}, (C_{7-50} \text{ aryl carbonate})_{1-100}, (C_{8-2000} \text{ alkylaryl carbonate})_{1-100}
    44
                                                 carbonate)_{1\text{-}100}, (C_{8\text{-}2000} \text{ arylalkyl carbonate})_{1\text{-}100}, -R^a\text{-}O\text{-}CO\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}CO\text{-}O\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}CO\text{-}O\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}(R^b \text{ or } Ar\text{-}R^b\text{-}Ar)\text{-}NH\text{-}(R^b \text{ or } Ar)\text{-}NH\text{-}(R^b \text{ or } Ar)\text{-}NH\text{-}(R^
     45
                                                 (C_{1-30} alkyl ether, C_{6-40} aryl ether, C_{7-2000} alkylaryl ether, or C_{7-2000} arylalkyl ether)<sub>1-100</sub>, -R<sup>a</sup>-
     46
                                                  O-CO-NH-(R^b or Ar-R^b-Ar)-NH-CO-O-(C_{2-50} alkyl ester, C_{7-60} aryl ester, C_{8-2000} alkylaryl
      47
                                                  ester, or C_{8-2000} arylalkyl ester)<sub>1-100</sub>, -R<sup>a</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C_{1-30} alkyl
       48
                                                   ether, C<sub>6-40</sub> aryl ether, C<sub>7-2000</sub> alkylaryl ether, or C<sub>7-2000</sub> arylalkyl ether)<sub>1-100</sub>-CO-NH-(R<sup>b</sup> or
       49
                                                   Ar-Rb-Ar)-NH-CO-O-, -Ra-O-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-O-(C2-50 alkyl ester, C7-60
       50
                                                   aryl ester, C<sub>8-2000</sub> alkylaryl ester, or C<sub>8-2000</sub> arylalkyl ester)<sub>1-100</sub>-R<sup>c</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-
       51
                                                   Ar)-NH-CO-O-, -Ra-NH-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-O-(C1-30 alkyl ether, C6-40 aryl
       52
                                                   ether, C_{7-2000} alkylaryl ether, or C_{7-2000} arylalkyl ether)<sub>1-100</sub>, -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-
       53
                                                    Ar)-NH-CO-O-(C2-50 alkyl ester, C7-60 aryl ester, C8-2000 alkylaryl ester, or C8-2000 arylalkyl
         54
                                                    ester)_{1-100}, -R^a-NH-CO-NH-(R^b or Ar-R^b-Ar)-NH-CO-O-(C_{1-30} alkyl ether, C_{6-40} aryl ether,
         55
                                                    C<sub>7-2000</sub> alkylaryl ether, or C<sub>7-2000</sub> arylalkyl ether)<sub>1-100</sub>-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-,
         56
                                                      -Ra-NH-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-O-(C2-50 alkyl ester, C7-60 aryl ester, C8-2000
         57
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alkylaryl ester, or C<sub>8-2000</sub> arylalkyl ester)<sub>1-100</sub>-R<sup>c</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-,
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- -Ra-O-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-NH-( $C_{2-50}$  alkyl amide,  $C_{7-60}$  aryl amide,  $C_{8-2000}$
- alkylaryl amide, or C<sub>8-2000</sub> arylalkyl amide)<sub>1-100</sub>, or -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-
- 61 CO-NH-(C<sub>2-50</sub> alkyl amide, C<sub>7-60</sub> aryl amide, C<sub>8-2000</sub> alkylaryl amide, or C<sub>8-2000</sub> arylalkyl
- amide)<sub>1-100</sub>; and each Z, independently, is -H or -G-D, wherein G is -R<sup>a</sup>-, -R<sup>a</sup>-Ar-, -Ar-R<sup>a</sup>-, or
- 63 -Ar-; and D is -H, -OH, -SH, -NH<sub>2</sub>, -NHOH, -SO<sub>3</sub>H, -OSO<sub>3</sub>H, -CO<sub>2</sub>H, -CONH<sub>2</sub>,
- -CONHNH<sub>2</sub>, -CH(NH<sub>2</sub>)-CO<sub>2</sub>H, -NH-CH<sub>2</sub>-CO<sub>2</sub>H, -P(OH)<sub>3</sub>, -PO(OH)<sub>2</sub>, -O-PO(OH)<sub>2</sub>, -O-PO(OH)<sub>2</sub>,
- PO(OH)-O-PO(OH)<sub>2</sub>, -O-PO(O $^-$ )-O-CH<sub>2</sub>CH<sub>2</sub>NH<sub>3</sub> $^+$ , -O-PO(O $^-$ )-O-CH<sub>2</sub>CH<sub>2</sub>-N $^+$ (CH<sub>3</sub>)<sub>3</sub>, -
- glycoside, -oligosaccharide, -CO-glycoside, -CO-oligosaccharide, -OCH<sub>3</sub>, -OCH<sub>2</sub>(CHOH)<sub>4</sub>-
- 67  $CH_2OH$ ,  $-OCH_2(CHOH)_2$ - $CH_2OH$ ,  $-CO-OCH_2(CHOH)_4$ - $CH_2OH$ ,  $-C_6H_3(OH)_2$ ,
- 68  $-N(CH_2CO_2H)_2$ ,  $-CO-N(CH_2CO_2H)_2$ ,  $-CO-NH-C(CH_2CH_2CO_2H)_3$ ,  $-CO-NH-C(CH_2CH_2CO_2H)_3$
- 69  $C(CH_2CH_2OH)_3$ ,  $-[CH_2-CH(CO_2R^a)]_{1-100}-H$ ,  $-NH_3^+$ ,  $-N^+H_2R^a$ ,  $-N^+HR^aR^b$ , or  $-N^+R^aR^bR^c$ ; each
- of R<sup>a</sup>, R<sup>b</sup>, and R<sup>c</sup>, independently, being C<sub>1-20</sub> linear or branched alkyl, and Ar being aryl;
- 71 R is hydroxy or amino;
- 72 W is O,  $C(CN)_2$ ,  $N^+Y_1Y_2$ , or V;
- 73 V is  $C_{5-20}$  aryl or  $C_{2-20}$  heteroaryl;
- 74 n is 1-10;
- 75 p is 0-20;
- 76 q is 0-20; and
- 77 r is 0 or 1.

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- The compound of claim 1, wherein F is a fullerene core of C<sub>60</sub>, C<sub>70</sub>, C<sub>76</sub>, C<sub>78</sub>, C<sub>82</sub>, C<sub>84</sub>, C<sub>92</sub>
   (methano)<sub>n</sub>C<sub>60</sub>, (pyrrolidino)<sub>n</sub>C<sub>60</sub>, La@C<sub>s</sub>, Ho@C<sub>s</sub>, Gd@C<sub>s</sub>, or Er@C<sub>s</sub>, in which n is 1-10,
- and s is 60, 74, or 82.
- 3. The compound of claim 2, wherein F is a fullerene core of  $C_{60}$ ,  $C_{70}$ , or  $C_{84}$ .
- 4. The compound of claim 1, wherein each of X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub>, X<sub>4</sub>, and X<sub>5</sub>, independently, is hydrogen.

- 5. The compound of claim 1, wherein each of Y<sub>1</sub>, Y<sub>2</sub>, and Y<sub>3</sub>, independently, is hydrogen, C<sub>1-2000</sub> alkyl, C<sub>6-40</sub> aryl, or C<sub>7-2000</sub> arylalkyl, optioanlly substituted with -OH, -SH, -NH<sub>2</sub>, -NHOH, -SO<sub>3</sub>H, -OSO<sub>3</sub>H, -CO<sub>2</sub>H, -CONH<sub>2</sub>, -CONHNH<sub>2</sub>, -CH(NH<sub>2</sub>)-CO<sub>2</sub>H, -NH-CH<sub>2</sub>-CO<sub>2</sub>H, -NH<sub>3</sub><sup>+</sup>, -N<sup>+</sup>H<sub>2</sub>R<sup>a</sup>, -N<sup>+</sup>HR<sup>a</sup>R<sup>b</sup>, or -N<sup>+</sup>R<sup>a</sup>R<sup>b</sup>R<sup>c</sup>,
- 6. The compound of claim 1, wherein each of Y<sub>1</sub>, Y<sub>2</sub>, and Y<sub>3</sub>, independently, is ethyl, hydroxyethyl, methoxyethyl, solfonylbutoxyethyl, hydroxycarbonylmethyl, or hydroxycarbonylethyl.
- 7. The compound of claim 1, wherein r is 0.

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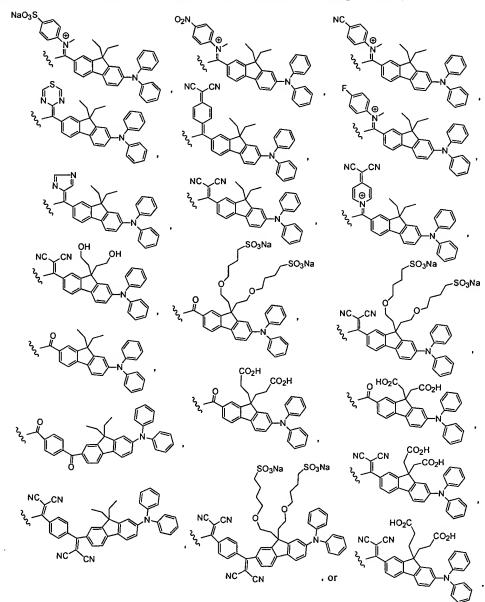
- 8. The compound of claim 1, wherein r is 1, and V is aryl.
- 9. The compound of claim 8, wherein V is phenyl.
- 10. The compound of claim 1, wherein W is O, C(CN)<sub>2</sub>, heteroaryl, N<sup>+</sup>Y<sub>1</sub>Y<sub>2</sub>, each of Y<sub>1</sub> and Y<sub>2</sub>, independently, being hydrogen, alkyl, aryl, or heteroaryl, or, together, being ary or heteroaryl.
- 11. The compound of claim 10, wherein W is O, C(CN)<sub>2</sub>,

$$O_2N$$
 $O_2N$ 
 $O_2N$ 

12. The compound of claim 1, wherein E is Y<sub>1</sub>,Y<sub>2</sub>-amino, Y<sub>2</sub>-amino, (Y<sub>1</sub>,Y<sub>2</sub>-alkyl)-amino,
Y<sub>1</sub>,Y<sub>2</sub>-ethylenediamino, (dihydroxymethyl)alkylamino, (X<sub>1</sub>,X<sub>3</sub>-aryl)amino, (Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>alkyl)amino, (Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>-aryl)amino, dihydroxyalkylamino, (trihydroxyalkyl)alkylamino,
or (dicarboxyalkyl)amino; and p is 1-4.

- 13. The compound of claim 12, wherein E is diphenylamino.
- 14. The compound of claim 1, wherein R is hydroxy or amino.
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- 15. The compound of claim 1, wherein q is 0.
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- 16. The compound of claim 1, wherein the compound is of the following structure of F(-M)<sub>n</sub>,
- in which F is a fullerene core of C<sub>60</sub>, n is 1-6, each M, independently, is



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17. A pharmaceutical composition, comprising a pharmaceutically acceptable carrier and a compound of the following formula:

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$$\begin{bmatrix} X_2 & X_1 & Y_1 & Y_2 & W \\ X_3 & X_4 & X_5 & P \end{bmatrix}$$

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wherein

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F is a fullerene core; E is  $Y_1, Y_2$ -amino,  $Y_2$ -amino,  $(Y_1, Y_2$ -alkyl)-amino,  $Y_1, Y_2$ -ethylenediamino, (dihydroxymethyl)alkylamino,  $(X_1, X_3$ -aryl)amino,  $X_1, X_3$ -aryloxy,  $Y_2$ -alkoxy,  $Y_1, Y_2$ -alkoxy,  $(Y_1,Y_2-amino)$ alkoxy,  $(Y_1,Y_2,Y_3-aryl)$ oxy, (dihydroxyalkyl)-aryloxy,  $(Y_1,Y_2,Y_3-alkyl)$ amino, (Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>-aryl)amino, dihydroxyalkylamino, Y<sub>1</sub>,Y<sub>2</sub>,Y<sub>3</sub>-alkoxy, (trihydroxyalkyl)alkoxy, (trihydroxyalkyl)alkylamino, (dicarboxyalkyl)amino,  $(Y_1, Y_2, Y_3-alkyl)$ thio,  $(X_1, X_3-alkyl)$  $aryl) thio, (Y_1, Y_2 - alkyl) thio, (dihydroxyalkyl) thio, Y_1, Y_2 - dioxoalkyl, tri-(Y_1, Y_2, Y_3 - alkyl) thio, (Y_1, Y_2 - alkyl) thio, (Y$ methylaminocarboxyethyl)methylamino, ((glycosidyl)oxoheteroaryl)amino, ((glycosidyl)oxoaryl)amino,  $(X_1, X_2, X_3$ -heteroaryl)amino,  $(X_1$ -diarylketone)amino,  $(T, X_1$ oxoaryl)amino, (T,X1-dioxoaryl)amino, (Y1-alkyl,Y2-alkyldioxoheteroaryl)amino, (Y1alkyl, Y2-alkyldioxoaryl) amino, (di(Y1, Y2-methyl) dioxoheteroaryl) amino, (di(Y1, Y2methyl)dioxoaryl)amino, ((glycosidyl)heteroaryl)amino, ((glycosidyl)aryl)amino, ((carboxylacetylalkyl)oxo-heteroaryl)amino, ((carboxylacetylalkyl)oxoaryl)amino, heteroaryl)oxy, (isopropylaminohydroxyalkyl)aryloxy,  $(X_1, X_2, X_3$ -oxoheteroaryl)oxy,  $(X_1, X_2, X_3$ -oxoaryl)oxy,  $(X_1, Y_1$ -oxoheteroaryl)oxy,  $(X_1$ -diarylketone)oxy,  $(T, X_1$ -oxoaryl)oxy, (X<sub>1</sub>,X<sub>2</sub>-dioxoaryl)oxy, (Y<sub>1</sub>,Y<sub>2</sub>,di-aminodihydroxy)alkyl, (X<sub>1</sub>,X<sub>2</sub>-heteroaryl)thio, ((tricarboxylalkyl)ethylene-diamino)alkoxy,  $(X_1, X_2$ -oxoaryl)thio,  $(X_1, X_2$ -dioxoaryl)thio, (glycosidylheteroaryl)thio, (glycosidylaryl)thio,  $Y_1$ -alkyl(thiocarbonyl)thio,  $Y_1,Y_2$ ,alkyl(thiocarbonyl)thio, Y1,Y2,Y3-alkyl(thiocarbonyl)thio, (Y1,Y2-aminothiocarbonyl)thio, (pyranosyl)thio, cysteinyl, tyrosinyl, (phenylalainyl)amino, (dicarboxyalkyl)thio.

(aminoaryl)<sub>1-100</sub>amino, (pyranosyl)<sub>1-100</sub>amino, (Y<sub>1</sub>-aminoaryl)<sub>1-100</sub>amino,

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(amino(sulfoaryl))<sub>1100</sub>amino, peptidyl, thymidinyl, uridinyl, guanosinyl, adenosinyl,
150
             cholesteryl, or biotinylalkoxy; each T, independently, being halo;
151
                         each of X_1, X_2, X_3, X_4, and X_5, independently, is -Y_2, -O-Y_2, -S-Y_2, -NH-Y_2, -CO-O-V_2
152
             Y_2, -O-CO-Y_2, -CO-NH-Y_2, -CO-NY<sub>1</sub>Y_2, -NH-CO-Y_2, -SO<sub>2</sub>-Y_2, -SO<sub>2</sub>-O-Y_2, -CHY<sub>1</sub>Y_2, or
153
             -NY_1Y_2;
154
                         each of Y<sub>1</sub>, Y<sub>2</sub>, and Y<sub>3</sub>, independently or taken together, is -B-Z or -Z; in which each
155
             B, independently, is -R^a-O-[Si(CH<sub>3</sub>)<sub>2</sub>-O-]<sub>1-100</sub>, C<sub>1-2000</sub> alkyl, C<sub>6-40</sub> aryl, C<sub>7-2000</sub> alkylaryl, C<sub>7-2000</sub>
156
             _{2000} arylalkyl, (C_{1-30} alkyl ether)_{1-100}, (C_{6-40} aryl ether)_{1-100}, (C_{7-2000} alkylaryl ether)_{1-100}, (C_{7-2000}
157
             _{2000} arylalkyl ether)<sub>1-100</sub>, (C<sub>1-30</sub> alkyl thioether)<sub>1-100</sub>, (C<sub>6-40</sub> aryl thioether)<sub>1-100</sub>, (C<sub>7-2000</sub> alkylaryl
158
             thioether)<sub>1-100</sub>, (C_{7-2000} \text{ arylalkyl thioether})_{1-100}, (C_{2-50} \text{ alkyl ester})_{1-100}, (C_{7-2000} \text{ arylalkyl thioether})_{1-100},
159
             (C_{8-2000} \text{ alkylaryl ester})_{1-100}, (C_{8-2000} \text{ arylalkyl ester})_{1-100}, -R^a-CO-O-(C_{1-30} \text{ alkyl ether})_{1-100}, -
160
             R^{a}-CO-O-(C_{6-40} aryl ether)<sub>1-100</sub>, -R^{a}-CO-O-(C_{7-2000} alkylaryl ether)<sub>1-100</sub>, -R^{a}-CO-O-(C_{7-2000}
161
             arylalkyl ether)<sub>1-100</sub>, (C_{4-50} \text{ alkyl urethane})_{1-100}, (C_{14-60} \text{ aryl urethane})_{1-100}, (C_{10-2000} \text{ alkylaryl})_{1-100}
162
             urethane)<sub>1-100</sub>, (C_{10-2000} \text{ arylalkyl urethane})_{1-100}, (C_{5-50} \text{ alkyl urea})_{1-100}, (C_{14-60} \text{ aryl urea})_{1-100},
163
             (C_{10-2000} \text{ alkylaryl urea})_{1-100}, (C_{10-2000} \text{ arylalkyl urea})_{1-100}, (C_{2-50} \text{ alkyl amide})_{1-100}, (C_{7-60} \text{ arylalkyl urea})_{1-100}
164
              amide)<sub>1-100</sub>, (C_{8-2000} \text{ alkylaryl amide})_{1-100}, (C_{8-2000} \text{ arylalkyl amide})_{1-100}, (C_{3-30} \text{ alkyl})
165
             anhydride)<sub>1-100</sub>, (C_{8-50} \text{ aryl anhydride})_{1-100}, (C_{9-2000} \text{ alkylaryl anhydride})_{1-100}, (C_{9-2000} \text{ arylalkyl})_{1-100}
166
              anhydride)<sub>1-100</sub>, (C_{2-30} \text{ alkyl carbonate})_{1-100}, (C_{7-50} \text{ aryl carbonate})_{1-100}, (C_{8-2000} \text{ alkylaryl})
167
             carbonate)<sub>1-100</sub>, (C<sub>8-2000</sub> arylalkyl carbonate)<sub>1-100</sub>, -R<sup>a</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-
168
             (C_{1-30} \text{ alkyl ether}, C_{6-40} \text{ aryl ether}, C_{7-2000} \text{ alkylaryl ether}, \text{ or } C_{7-2000} \text{ arylalkyl ether})_{1-100}, -R^a
169
             O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C<sub>2-50</sub> alkyl ester, C<sub>7-60</sub> aryl ester, C<sub>8-2000</sub> alkylaryl
170
             ester, or C<sub>8-2000</sub> arylalkyl ester)<sub>1-100</sub>, -R<sup>a</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C<sub>1-30</sub> alkyl
171
              ether, C_{6-40} aryl ether, C_{7-2000} alkylaryl ether, or C_{7-2000} arylalkyl ether)<sub>1-100</sub>-CO-NH-(R^b or
172
             Ar-R<sup>b</sup>-Ar)-NH-CO-O-, -R<sup>a</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C<sub>2-50</sub> alkyl ester, C<sub>7-60</sub>
173
             aryl ester, C<sub>8-2000</sub> alkylaryl ester, or C<sub>8-2000</sub> arylalkyl ester)<sub>1-100</sub>-R<sup>c</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-
174
             Ar)-NH-CO-O-, -Ra-NH-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-O-(C1-30 alkyl ether, C6-40 aryl
175
             ether, C<sub>7-2000</sub> alkylaryl ether, or C<sub>7-2000</sub> arylalkyl ether)<sub>1-100</sub>, -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-
176
             Ar)-NH-CO-O-(C_{2-50} alkyl ester, C_{7-60} aryl ester, C_{8-2000} alkylaryl ester, or C_{8-2000} arylalkyl
177
             ester)<sub>1-100</sub>, -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C<sub>1-30</sub> alkyl ether, C<sub>6-40</sub> aryl ether,
178
             C<sub>7-2000</sub> alkylaryl ether, or C<sub>7-2000</sub> arylalkyl ether)<sub>1-100</sub>-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-.
179
             -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-(C<sub>2-50</sub> alkyl ester, C<sub>7-60</sub> aryl ester, C<sub>8-2000</sub>
180
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alkylaryl ester, or C<sub>8-2000</sub> arylalkyl ester)<sub>1-100</sub>-R<sup>c</sup>-O-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-CO-O-,
181
                           -Ra-O-CO-NH-(Rb or Ar-Rb-Ar)-NH-CO-NH-(C2-50 alkyl amide, C7-60 aryl amide, C8-2000
182
                           alkylaryl amide, or C<sub>8-2000</sub> arylalkyl amide)<sub>1-100</sub>, or -R<sup>a</sup>-NH-CO-NH-(R<sup>b</sup> or Ar-R<sup>b</sup>-Ar)-NH-
183
                           CO-NH-(C2-50 alkyl amide, C7-60 aryl amide, C8-2000 alkylaryl amide, or C8-2000 arylalkyl
184
                           amide)<sub>1-100</sub>; and each Z, independently, is -H or -G-D, wherein G is -R<sup>a</sup>-, -R<sup>a</sup>-Ar-, -Ar-R<sup>a</sup>-, or
185
                            -Ar-: and D is -H, -OH, -SH, -NH<sub>2</sub>, -NHOH, -SO<sub>3</sub>H, -OSO<sub>3</sub>H, -CO<sub>2</sub>H, -CONH<sub>2</sub>,
186
                           -CONHNH<sub>2</sub>, -CH(NH<sub>2</sub>)-CO<sub>2</sub>H, -NH-CH<sub>2</sub>-CO<sub>2</sub>H, -P(OH)<sub>3</sub>, -PO(OH)<sub>2</sub>, -O-PO(OH)<sub>2</sub>, 
187
                           PO(OH)-O-PO(OH)<sub>2</sub>, -O-PO(O<sup>-</sup>)-O-CH<sub>2</sub>CH<sub>2</sub>NH<sub>3</sub><sup>+</sup>, -O-PO(O<sup>-</sup>)-O-CH<sub>2</sub>CH<sub>2</sub>-N<sup>+</sup>(CH<sub>3</sub>)<sub>3</sub>,
188
                            -glycoside, -oligosaccharide, -CO-glycoside, -CO-oligosaccharide, -OCH<sub>3</sub>, -OCH<sub>2</sub>(CHOH)<sub>4</sub>-
189
                            CH<sub>2</sub>OH, -OCH<sub>2</sub>(CHOH)<sub>2</sub>-CH<sub>2</sub>OH, -CO-OCH<sub>2</sub>(CHOH)<sub>4</sub>-CH<sub>2</sub>OH, -C<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub>,
190
                            -N(CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub>, -CO-N(CH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub>, -CO-NH-C(CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>H)<sub>3</sub>, -CO-NH-
191
                           C(CH_2CH_2OH)_3, -[CH_2-CH(CO_2R^a)]_{1-100}-H, -NH_3^+, -N^+H_2R^a, -N^+HR^aR^b, or -N^+R^aR^bR^c, each
192
                            of R<sup>a</sup>, R<sup>b</sup>, and R<sup>c</sup>, independently, being C<sub>1-20</sub> linear or branched alkyl, and Ar being aryl;
193
                                                    R is alkyl, hydroxy, or amino;
194
                                                    W is O, C(CN)_2, N^+Y_1Y_2, or V;
 195
                                                    V is C_{5-20} aryl or C_{2-20} heteroaryl;
 196
                                                    n is 1-10;
 197
                                                    p is 0-20;
 198
                                                    q is 0-20; and
 199
                                                    r is 0 or 1.
 200
 201
                             18. The pharmaceutical composition of claim 17, wherein wherein F is a fullerene core of
 202
                                         C<sub>60</sub>, C<sub>70</sub>, C<sub>76</sub>, C<sub>78</sub>, C<sub>82</sub>, C<sub>84</sub>, C<sub>92</sub> (methano)<sub>n</sub>C<sub>60</sub>, (pyrrolidino)<sub>n</sub>C<sub>60</sub>, La@C<sub>s</sub>, Ho@C<sub>s</sub>,
 203
                                         Gd@C_s, or Er@C_s, in which n is 1-10, and s is 60, 74, or 82.
 204
 205
                              19. The pharmaceutical composition of claim 17, wherein each of X_1, X_2, X_3, X_4, and X_5,
  206
                                         independently, is hydrogen.
  207
  208
                             20. The pharmaceutical composition of claim 17, wherein the compound is of the following
  209
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structure of F(-M)<sub>n</sub>, in which F is a fullerene core of C<sub>60</sub>, n is 1-6, each M, independently,

210

211

is: